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Languages, Systems and Tools for Systolic Computation

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a. **Papers Submitted to Refereed Journals (and not yet published)**

1. Yaacoby, Y., and P. R. Cappello, "Scheduling a system of affine recurrence equations onto a systolic array," UCSB TRCS87-19, submitted to the *J. of VLSI Signal Processing*, Oct. 1988.
2. Cappello, P. R., E. Gallopoulos, and C. Koc, "Systolic computation of interpolating polynomials," TRCS88-20, submitted to *Computing*, Aug. 1988.
3. Cappello, P. R., "A bijection between natural numbers and rooted trees," UCSB TRCS88-18, submitted to the *SIAM J. on Discrete Mathematics*, July 1988.
4. Bruno, J., and P. R. Cappello, "Implementing the Beam and Warming method on the hypercube," UCSB TRCS88-22, submitted to the *J. Parallel and Distributed Computing*, July 1988.
5. Yaacoby, Y., and P. R. Cappello, "Bounded broadcast in systolic arrays," UCSB TRCS88-13, submitted to the *IEEE Trans. on Computers*, Apr. 1988.
6. Yaacoby, Y., and P. R. Cappello, "Decoupling the dimensions of a system of affine recurrence equations," UCSB TRCS88-12, submitted to the *SIAM J. on Comput.*, Apr. 1988.
7. Yaacoby, Y., P. R. Cappello, D. Witt, and K. C. Millett, "Computing a fundamental region for a finite matrix group acting on a Euclidean space," UCSB TRCS88-4, submitted to the *SIAM J. on Comput.*, Feb. 1988.
8. Yaacoby, Y., and P. R. Cappello, "Converting affine recurrence equations to quasi-uniform recurrence equations," UCSB TRCS87-18, submitted to the *SIAM J. on Comput.*, Feb. 1988. (also ONR contract N00014-85-K-0553).

b. **Papers Published in Refereed Journals**

1. Engstrom, B. R., and P. R. Cappello, "The SDEF systolic programming system," to appear in the *J. Parallel and Distributed Computing*, Aug. 1989.
2. Wu, C-W, and P. R. Cappello, "Easily testable iterative logic arrays," UCSB TRCS87-16, accepted in the *IEEE Trans. on Computers*, Oct. 1988.
3. Davidson, G., P. R. Cappello, and A. Gersho, "Systolic architecture for vector quantization," *IEEE Trans. Acoust., Speech, Signal Processing*, vol. 36, no. 10, pp. 1651-1664, Oct. 1988.
4. Cappello, P. R., and W. L. Miranker, "Systolic super summation," *IEEE Trans. on Computers*, vol. 37, no. 6, pp. 657-677, June 1988.
5. Cappello, P. R., and A. J. Laub, "Systolic computation of multivariable frequency response," *IEEE Trans Autom. Control*, vol. 33, no. 6, pp. 550-558, June 1988.
6. Wu, C-W, and P. R. Cappello, "Application-specific CAD of VLSI second-order sections," *IEEE Trans. Acoust., Speech, Signal Processing*, vol. ASSP-36, no. 5, pp. 813-825, May 1988.
7. Cappello, P. R., and C-W Wu, "Computer-aided design of VLSI FIR filters," *Proc. of the IEEE*, vol. 75, no. 9, pp. 1260-1271, Sep. 1987 (also translated into Russian).
8. Cappello, P. R., "Gaussian elimination on a hypercube automaton," *J. of Parallel and Distributed Computing*, vol. 4, no. 3, pp. 288-308, June 1987.
9. Cappello, P. R., and K. Steiglitz, "Unifying VLSI array design with linear transformations of space-time," *Advances in Computing Research*, vol. 2, pp. 23-65, 1985.

10. Cappello, P. R., and K. Steiglitz, "A note on free accumulation in VLSI filter architectures," *IEEE Trans. on Circuits Syst.*, vol. CAS-32, no. 3, pp. 291-296, Mar. 1985.
11. Cappello, P. R., and K. Steiglitz, "Some complexity issues in digital signal processing," *IEEE Trans. on Acoust., Speech, Signal Processing*, vol. ASSP-32, no. 5, pp. 1037-1041, Oct. 1984.
- c. **Books (and sections thereof) Submitted for Publication**  
None.
- d. **Books (and sections thereof) Published**
  1. Engstrom, B. R. and P. R. Cappello, "The SDEF Systolic Programming System." In *Concurrent Computations*, S. K. Tewksbury, B. W. Dickinson, and S. C. Schwartz (Eds.), pp. 263-302, Plenum Press, New York, Sep. 1988.
  2. Yaacoby, Y., and P. R. Cappello, "Converting Affine Recurrence Equations to Quasi-Uniform Recurrence Equations." In *VLSI Algorithms and Architectures* J. H. Reif (Ed.), pp. 319-328, Springer-Verlag, June, 1988.
  3. Cappello, P. R. "Spacetime Transformations of Cellular Algorithms." In *Systolic Signal Processing Systems*, pp. 161-207, E. E. Swartzlander, Jr. (Ed.), Marcel Dekker Inc., New York, NY., July 1987.
  4. Cappello, P. R., "Transforming Systolic Arrays in Spacetime." In *Digital Communications*, E. Biglieri and G. Prati (Eds.), pp. 219-233, North-Holland, New York 1986.
  5. *VLSI Signal Processing*, (Co-editor), IEEE Press, Inc., New York, 1984.
- e. **Patents Filed**  
None.
- f. **Patents Granted**  
None.
- g. **Invited Presentations at Topical or Scientific/Technical Society Conferences**
  1. "A New Bijection between Natural Numbers and Rooted Trees," *4th SIAM Conf. on Discrete Mathematics*, San Francisco, June 1988.
  2. Yaacoby, Y., and P. R. Cappello, "Converting Affine Recurrence Equations to Quasi-Uniform Recurrence Equations," in *Proc. 3rd Aegean Workshop on Computing*, Corfu, Greece, June, 1988 (see BOOKS 2.).
  3. Yaacoby, Y., and P. R. Cappello, "Scheduling a System of Affine Recurrence Equations onto a Systolic Array," *Proc. Int. Conf. on Systolic Arrays*, pp. 373-382, K. Bromley, S-Y Kung, and E. Swartzlander (Eds.), Computer Society Press, San Diego, May 1988.
  4. Cappello, P. R., and A. J. Laub, "Systolic Computation of Multivariable Frequency Response," *Proc. O-E/LASE'88 (Optoelectronics and Laser Applications in Science and Engineering) - High Speed Computing*, Vol. 880, pp. 150-157, Los Angeles, Jan. 1988.
  5. Bruno, J., and P. R. Cappello, "Implementing the Beam and Warming Method on the Hypercube," *Proc. 3rd Conf. on Hypercube Concurrent Computers and Applications*, vol. II (Applications), pp. 1073-1087, ACM Press, Pasadena, Jan. 1988.
  6. Engstrom, B. R., and P. R. Cappello, "The SDEF Systolic Programming System," *Princeton Workshop on Algorithm, Architecture, and Technology Issues in Models of*

*Concurrent Computation*, Princeton, Sep. 1987 (see BOOKS 1.).

7. Engstrom, B. R., and P. R. Cappello, "The SDEF Systolic Programming System," *Proc. Int. Conf. on Parallel Processing*, pp. 645-652, St. Charles, IL, Aug. 1987.
8. Wu, C-W, and P. R. Cappello, "Computer-Aided Design of VLSI Second-Order Sections," *Proc. Int. Conf. Acoustics, Speech, and Signal Processing*, pp. 44.4.1-44.4.4, Dallas, Apr. 1987.
9. Wu, C-W, and P. R. Cappello, "Application-Specific CAD of High-Throughput IIR Filters," *Proc. 32nd IEEE Computer Society Int. Conf. (Compcon)*, pp. 302-305, San Francisco, Feb. 1987.
10. Cappello, P. R., G. Davidson, A. Gersho, C. Koc, and V. Somayazulu, "A Systolic Vector Quantization Processor for Real Time Speech Coding," *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing*, pp. 2143-2146, Tokyo, JAPAN, Apr. 1986.
11. Cappello, P. R., "Languages and Tools for Systolic Computation," *ONR Workshop on Systolic Algorithms and Architectures*, Hilton Head, SC, Dec. 1986.
12. Cappello, P. R., "Systolic Design for Digital Signal Processing," *IEEE Philadelphia Section Seminar on Systolic Parallel Architectures for Signal Processing*, University of Pennsylvania, Apr. 1986.
13. Cappello, P. R., "An FIR Filter Tissue," *ONR Workshop on Ultra Submicron Architectures*, Pasadena, Dec. 1985.
14. Cappello, P. R., "Solving Dense Linear Systems on a Hypercube Automaton," *selected presentation at the SIAM Conf. on Parallel Processing for Scientific Computing*, Norfolk, VA, Nov. 1985.
15. Cappello, P. R., "Systolic Design for Digital Signal Processing," *Symposium on the Impact of VLSI on Signal Processing*, Communications Research Laboratory, McMaster University, Hamilton, Ontario, CANADA, Oct. 1985.
16. Wu, C-W, P. R. Cappello, and M. Saboff, "An FIR Filter Tissue," *Proc. 19th Asilomar Conf. on Circuits, Systems, and Computers*, pp.283-287, Pacific Grove, CA, Nov. 1985.
17. Cappello, P. R., "Transforming Systolic Arrays in Spacetime," *Int. Workshop on Digital Communications*, Tirrenia, ITALY, Sep. 1985, (see BOOKS 4.).
18. Cappello, P. R., "Mapping Gaussian Elimination onto Multiprocessor Architectures," *Computer Science Department*, Yale University, New Haven, CT, Aug. 1985.
19. Cappello, P. R., "A Mesh Automaton for Solving Dense Linear Systems," *Proc. Int. Conf. on Parallel Processing*, pp. 418-425, St. Charles, IL, Aug. 1985.
20. Cappello, P. R., "Towards an FIR Filter Tissue," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, pp. 276-279, Tampa, FL, Mar. 1985.
21. Cappello, P. R., and K. Steiglitz, "Selecting Systolic Designs Using Linear Transformations of Space-Time," *Proc. SPIE Conference: Real-Time Signal Processing VII*, San Diego, Aug. 1984.

i. **Honors/Awards/Prizes**

None.

j. **Technical Reports Published or Non-refereed Journals**

None besides those referenced above in item a.

- k. **Graduate Students and Postdoctorals Supported Under the Contract**  
No. Graduate Students: 2.

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